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Timing of Side-Dress Applications of N for Corn in Conventional and No-Till Systems

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Abstract

In general, conventional tillage averaged nearly 40 bu/acre greater corn yield than no-till likely because of improved growth during the season. With conventional tillage, all side-dress treatments resulted in greater yield than with all N applied pre-plant. However, in lower-yielding no-till systems, the yield response to side-dress applications appeared to be greater for V10 applications compared with those at V6.

Keywords

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Timing of Side-Dress Applications of N for Corn in Conventional and No-Till Systems

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Summary

In general, conventional tillage averaged nearly 40 bu/acre greater corn yield than no-till likely because of improved growth during the season. With conventional tillage, all side-dress treatments resulted in greater yield than with all N applied pre-plant. However, in lower-yielding no-till systems, the yield response to side-dress applications appeared to be greater for V10 applications compared with those at V6.

Introduction

Environmental conditions vary widely in the spring in southeastern Kansas. As a result, much of the N applied prior to corn planting may be lost before the time of maximum plant N uptake. Side-dress or split applications to provide N during rapid growth periods may improve N use efficiency while reducing potential losses to the environment. The objective of this study was to determine the effect of timing of side-dress N fertilization compared with pre-plant N applications for corn grown on a claypan soil.

Experimental Procedures

The experiment was established in spring 2015 on a Parsons silt loam soil at the Parsons unit of the Kansas State University Southeast Agricultural Research Center. The experiment was a split-plot arrangement of a randomized complete block design with four blocks (replications). Whole plot tillage treatments were conventional tillage (chisel, disk, and field cultivate) and no tillage. Sub-plot nitrogen treatments were six pre-plant/side-dress N application combinations that include 1) a no-N control, 2) 150 lb N/acre applied pre-plant, 3) 100 lb N/acre applied pre-plant with 50 lb N/acre applied at the V6 (six-leaf) growth stage, 4) 100 lb N/acre applied pre-plant with 50 lb N/acre applied at the V10 (ten-leaf) growth stage, 5) 150 lb N/acre applied pre-plant with 50 lb N/acre applied at the V6 growth stage, and 6) 150 lb N/acre applied pre-plant with 50 lb N/acre applied at the V10 growth stage. The N source for all treatments was liquid urea-ammonium nitrate (28% N) fertilizer. Pre-plant N fertilizer was applied on March 23, 2015, side-dress N at V6 on June 4, 2015, and side-dress N at V10 on June 19, 2015 to appropriate plots. Corn was planted on April 23 and harvested on September 14, 2015.

Results and Discussion

The corn stand in 2015 was unaffected by tillage or N treatments (data not shown). However, dry matter production during the growing season was greater with conven-

tional tillage than with no-till at every measured growth stage (Fig. 1). There was little difference in dry matter production between the N fertilizer treatments, except that the growth with all N treatments was greater than in the no-N control (data not shown). Even though overall corn yield averaged nearly 40 bu/acre more with conventional tillage than with no-till (main effect data not shown), yield was also affected by a tillage × N treatment interaction (Fig. 2). With conventional tillage, yields were improved by 20% or more when either splitting the N or adding more N side-dressed at V6 or V10 stages compared with applying all N pre-plant. In no-till, splitting the 150 lb N/acre to 100 lb N/acre applied pre-plant and 50 lb N/acre side-dressed at V6 did not significantly increase yields compared with all N pre-plant, but did increase yield when side-dressed at V10. In addition, when adding an additional 50 lb N/acre as a side-dress application to 150 lb N/acre applied pre-plant, the V10 side-dress application resulted in 22% greater yield than when applied at V6.

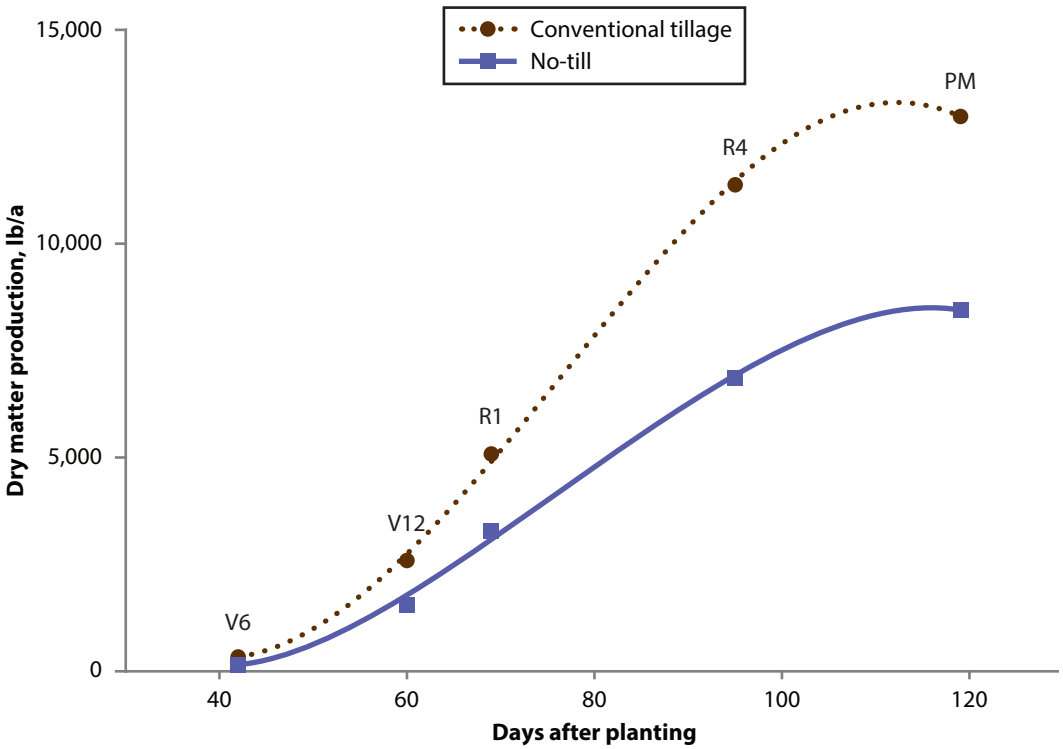

Figure 1. Dry matter production through the growing season in 2015 as affected by tillage. Conventional tillage: chisel, disk, field cultivate. Growth stages: V6, six-leaf; V12, 12-leaf; R1, silking; R4, dough; PM, physiological maturity.

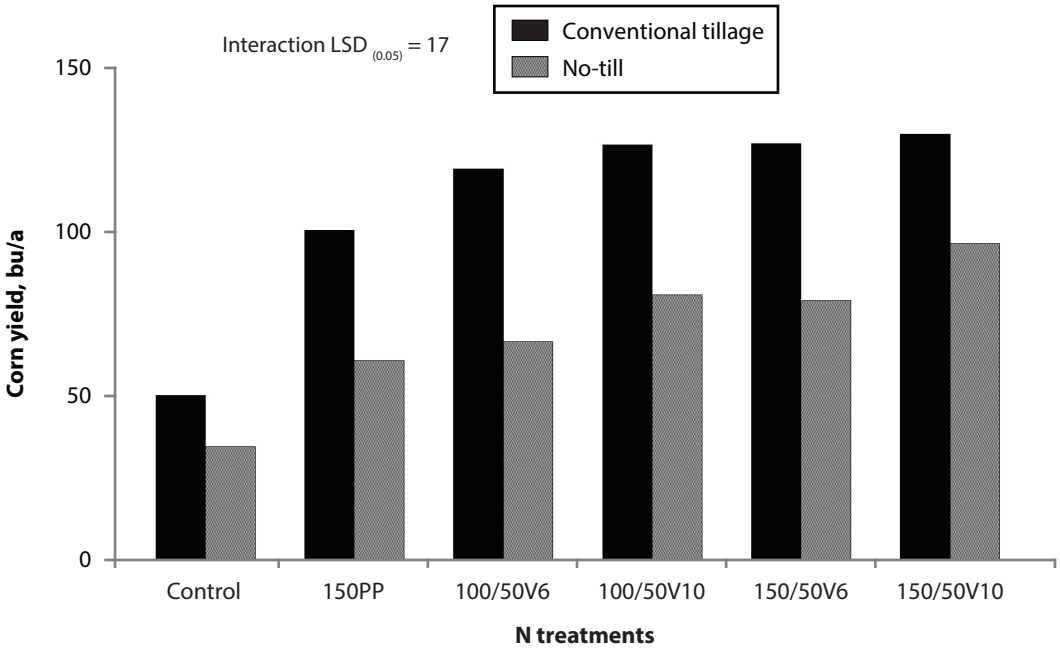

Figure 2. Effect of tillage and nitrogen treatments on short-season corn yield in 2015. Conventional tillage: chisel, disk, and field cultivate. Nitrogen treatments: Control, no N fertilizer; 150 PP, 150 lb N/acre applied pre-plant with no side-dress N; 100/50V6, 100 lb N/acre applied pre-plant with 50 lb N/acre side-dress applied at V6 (six-leaf) growth stage; 100/50V10, 100 lb N/acre applied pre-plant with 50 lb N/acre side-dress applied at V10 (ten-leaf) growth stage; 150/50V6, 150 lb N/acre applied pre-plant with 50 lb N/acre side-dress applied at V6 growth stage; 150/50V10, 150 lb N/acre applied pre-plant with 50 lb N/acre side-dress applied at V10 growth stage.